

Intel's Next Generation Platforms

Getting More Out Of Every Server

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Vice President, Digital Enterprise Group
General Manager, Server Platforms Group

Risk Factors

- Today's presentations contain forward-looking statements. All statements made that are not historical facts are subject to a number of risks and uncertainties, and actual results may differ materially. Please refer to our most recent Earnings Release and our most recent Form 10-Q or 10-K filing for more information on the risk factors that could cause actual results to differ.
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Agenda

- Intel Enterprise Development
- Intel® Xeon® MP Platform Transitions
- Intel® Xeon® DP Platforms
 - Platform Performance
 - Power Consumption
 - Performance Per Watt
- Intel® Itanium® Momentum

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Intel Enterprise Development

Outstanding Execution

Deliverable	*Timing*
Dual-Core DP	*Paxville DP Added Oct '05*
Virtualization	*Intel® VT 1 yr pull in Nov '05*
Leading Perf/Watt & 65nm	*Sossaman 31W Added Mar '06*
Dual-Core MP	*Paxville MP 5 Month Pull In*
Quad-Core	*Quad-Core Demo Feb '06*
Intel® Core™ Microarchitecture	*DP Woodcrest Pulled in to Jun '06*
LV Woodcrest	*Forecast Pull in to Q3 '06*

Announcing: Tulsa Processor Pull-In to Q3'06

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Tulsa Boosts Xeon® MP Performance

Forecast: Tulsa Pull in to Q3'06



Q3'06 Q4'06

16MB Shared On-die Cache

Up to 2x performance increase vs. prior generation

Performance & Rack-Optimized SKUs

Intel® Virtualization Technology

Intel® Cache Safe Technology

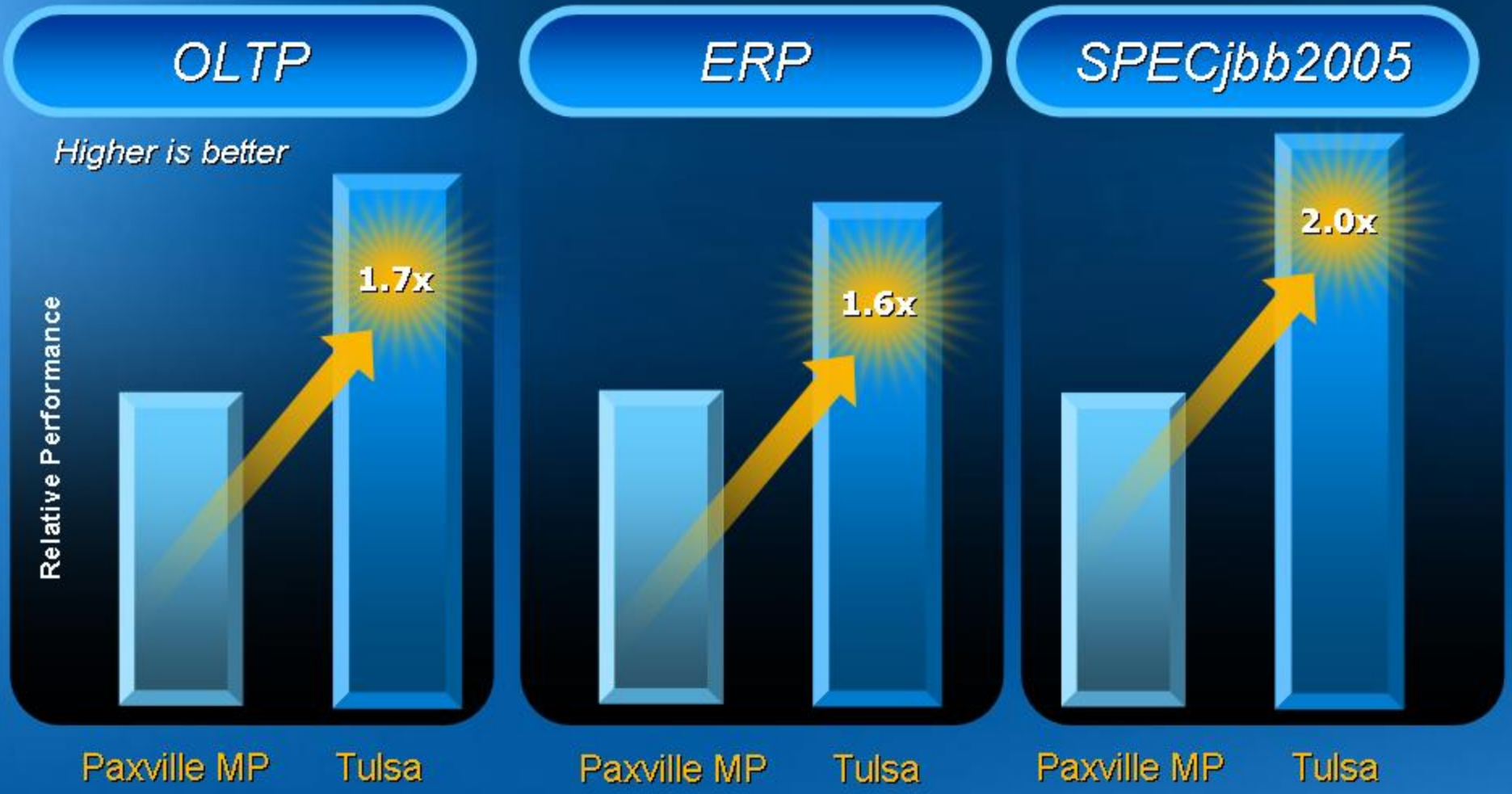
Leadership RAS



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Tulsa-Truland Platform Performance



Tulsa Provides A Significant Performance Boost For Many Enterprise Applications

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A More Reliable Server

Unique Intel x86 Reliability Features

Feature	*Benefit*	Intel® Xeon® Platforms	Other x86 Platforms
Memory ECC	*Data Integrity & Availability*	☑	☑
Enhanced Memory ECC	*Data Integrity & Availability*	☑	☐
Memory Sparing	*Data Availability*	☑	☐
Memory Mirroring	*Data Protection*	☑	☐
Memory CRC	*Continued Operation Data Availability*	☑	☐
Symmetric Access to all CPUs	*Server Continuity*	☑	☐

A Better Business Foundation

Current as of March, 2006, based on Intel's planned H1'06 platforms and competitive shipping platforms . Source Intel Corp.

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Bensley: Holistic Server Platform Approach



Dual & Quad-Core Processors

Dempsey Launched: May 23
Woodcrest Launch: Jun 26
Quad-Core Demo: Feb '06

Chipsets



intel
Xeon® inside™

5000 Sequence



Storage & Networking Interfaces

Intel® I/O Acceleration Technology

Intel® Virtualization Technology

Advanced Technologies

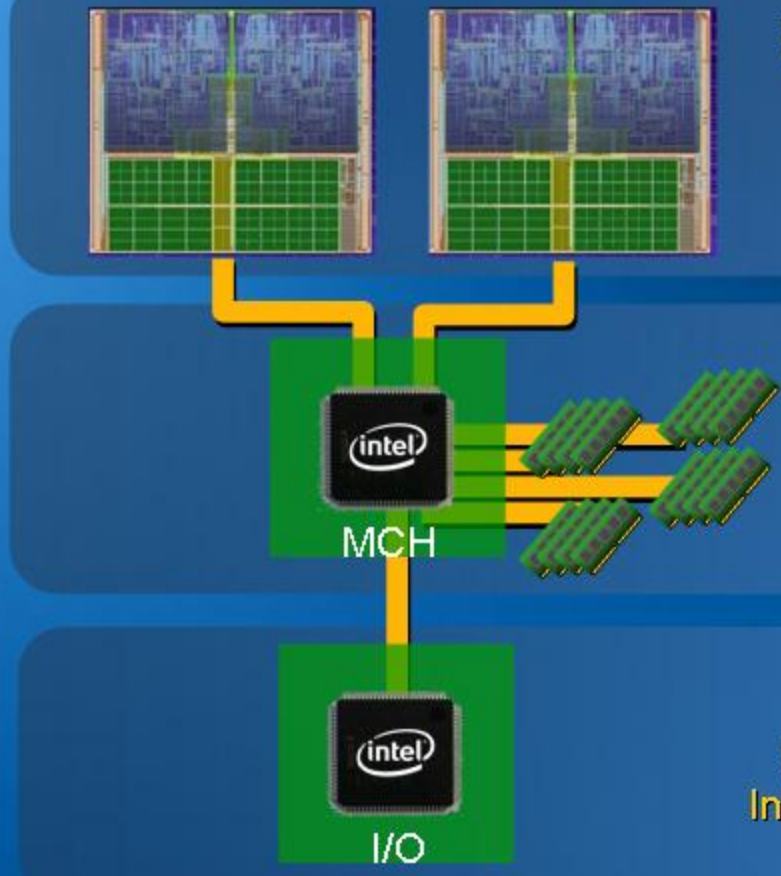
Fully Buffered DIMMs



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Platform Level Performance and Power Efficiency

Platform Innovation



Dual Independent High-Speed Buses
Up to 1333

Leading Memory Technology
FB-DIMM

High Performance I/O
Intel® I/O Acceleration Technology

Up To **3X** Performance[1]

Up To **3X** Faster and 4x Capacity[2]

Greater than **2X** Throughput[3]

Die photos are not to scale

[1] Based on SPECint*_rate_base2000 vs. Intel Xeon Single-Core

[2] Vs. DDR2-400 Memory

[3] Vs. Standard Gigabit Ethernet

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Energy Efficient Performance

$$\text{Performance Per Watt} = \frac{\text{System Performance}}{\text{System Power Consumption}}$$

Go to: www.intelstartyourengines.com

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DP Performance Scorecard

With Bensley Platform as of 5/23/06

Segment Workload	Bensley Platform	Other x86
Perf / Watt	☑	
App Server	☑	
Database	☑	
Integer	☑	
Floating Point	☑	
Collaboration	☑	
Web Server	☑	
ERP, CRM	☑	
Decision Support	☑	
Finance	☑	
Workstation	☑	

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Source: Intel Corp.

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Bensley/Xeon 5160 Performance Publications

SERVER BENCHMARKS	Xeon over AMD Opt 2.60 DC
TPC-C	1.49x
SAP-SD 2-Tier	1.21x ‡
SPECjbb2005	1.58x ‡
MMB3 (Microsoft Exchange)	1.12x
Lotus Domino 7.0	1.30x
SPECWeb2005	1.09x
SPECint_rate_base2000	1.61x
SPECfp_rate_base2000(Lin	1.14x
SPECfp_rate_base2000(Wi	1.25x
SPECint_base2000	1.76x
SPECfp_base2000	1.40x
Web Bench	1.20x

HPC BENCHMARKS	
Linpack	2.31x ‡‡
Fluent	1.27x ‡‡
LS-Dyna	1.27x ‡‡
Star-CD (A-Class)	0.93x ‡‡

WORKSTATION BENCHMARKS	Xeon over AMD Opt 2xx
SPECapc* for SolidWorks* - MCAD over	1.16x
SPECviewperf* 9.0	1.16x
SPECapc* for 3ds Max* 7 - Interactive	1.50x
SPECapc* 3ds max* 7 Rendering	1.71x
OCUS for Pro/E WF2	1.16x
SPECapc* Maya 6.5	1.13x
SPECapc* for Pro-E WF2* - MCAD overa	1.02x
SPECapc* for UGS NX3* - MCAD overall	0.80x

APPLICATION PERFORMANCE	Xeon vs Opt 2.6
BlackScholes	1.13x
SunGard ACR	1.25x
WMLS - Windows Media Load Simulator	1.12x

PERFORMANCE PER WATT	Xeon vs Opt 2.6
SPECint_rate_base2000	1.84x
WebBench	1.47x
SunGard ACR	1.43x
BlackScholes	1.38x
WMLS	1.33x

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‡ AMD Opteron 2.4GHz DC

‡‡ AMD Opteron 2.2GHz DC

Xeon 5080 – Dual-Core Intel® Xeon® Processor 5080; ("Dempsey 3.73 GHz")
Xeon 5160 – Dual-Core Intel® Xeon® Processor 5160; ("Woodcrest 3.00 GHz")
Opteron 2.60 DC – Dual-Core AMD Opteron™ Model 285 (2.60 GHz)

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Bensley Platform Performance

Published Results on Integer, Java and Database Benchmarks



Data Source: Published or Submitted results as of May 23, 2006. See backup for details

Bensley Platform Delivers Server Performance Leadership

Xeon 5080 – Dual-Core Intel® Xeon® Processor 5080; ("Dempsey 3.73 GHz");
Xeon 5160 – Dual-Core Intel® Xeon® Processor 5160; ("Woodcrest 3.00 GHz");
Opteron 2.60 DC – Dual-Core AMD Opteron™ Model 285 (2.60 GHz);

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Bensley Platform Performance

Published Results on Floating Point, ERP & Collaboration Benchmarks



Data Source: Published or Submitted results as of May 23, 2006. See backup for details

Intel Xeon Processor 5160 Outperforms AMD Opteron in key Server benchmarks

Opteron 2.60 DC – Dual-Core AMD Opteron™ Model 285 (2.60 GHz);
Xeon 5080 – Dual-Core Intel® Xeon® Processor 5080; ("Dempsey 3.73 GHz");
Xeon 5160 – Dual-Core Intel® Xeon® Processor 5160; ("Woodcrest 3.00 GHz");

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Energy Efficient Performance

$$\text{Performance Per Watt} = \frac{\text{System Performance}}{\text{System Power Consumption}}$$

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Server Power Consumption
"Watts at the Wall"

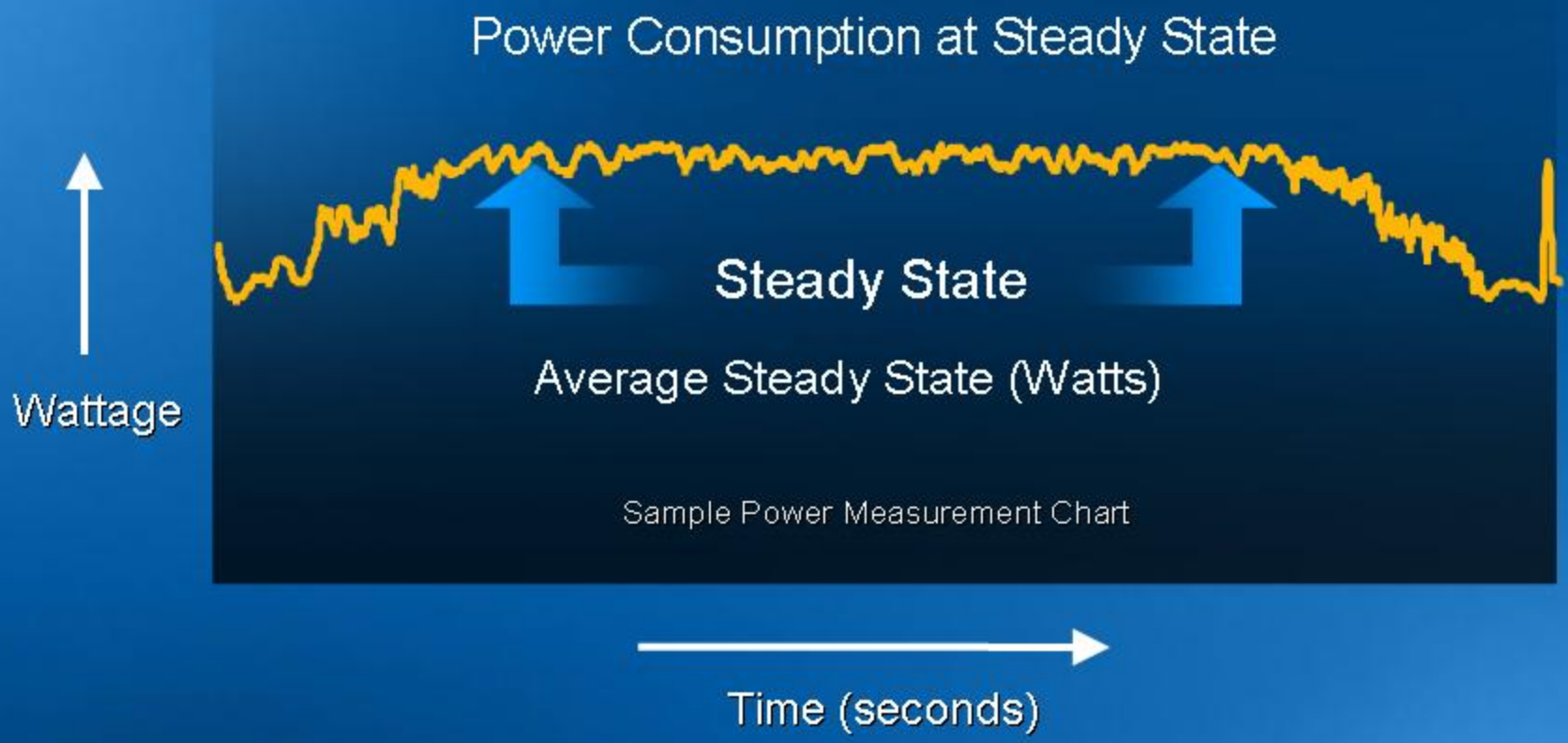
- Customers want to know how much power the system is consuming under real workloads – "Watts at the Wall"
- Use external power measurement tool
- Server connects to Wall power outlet via Power Meter



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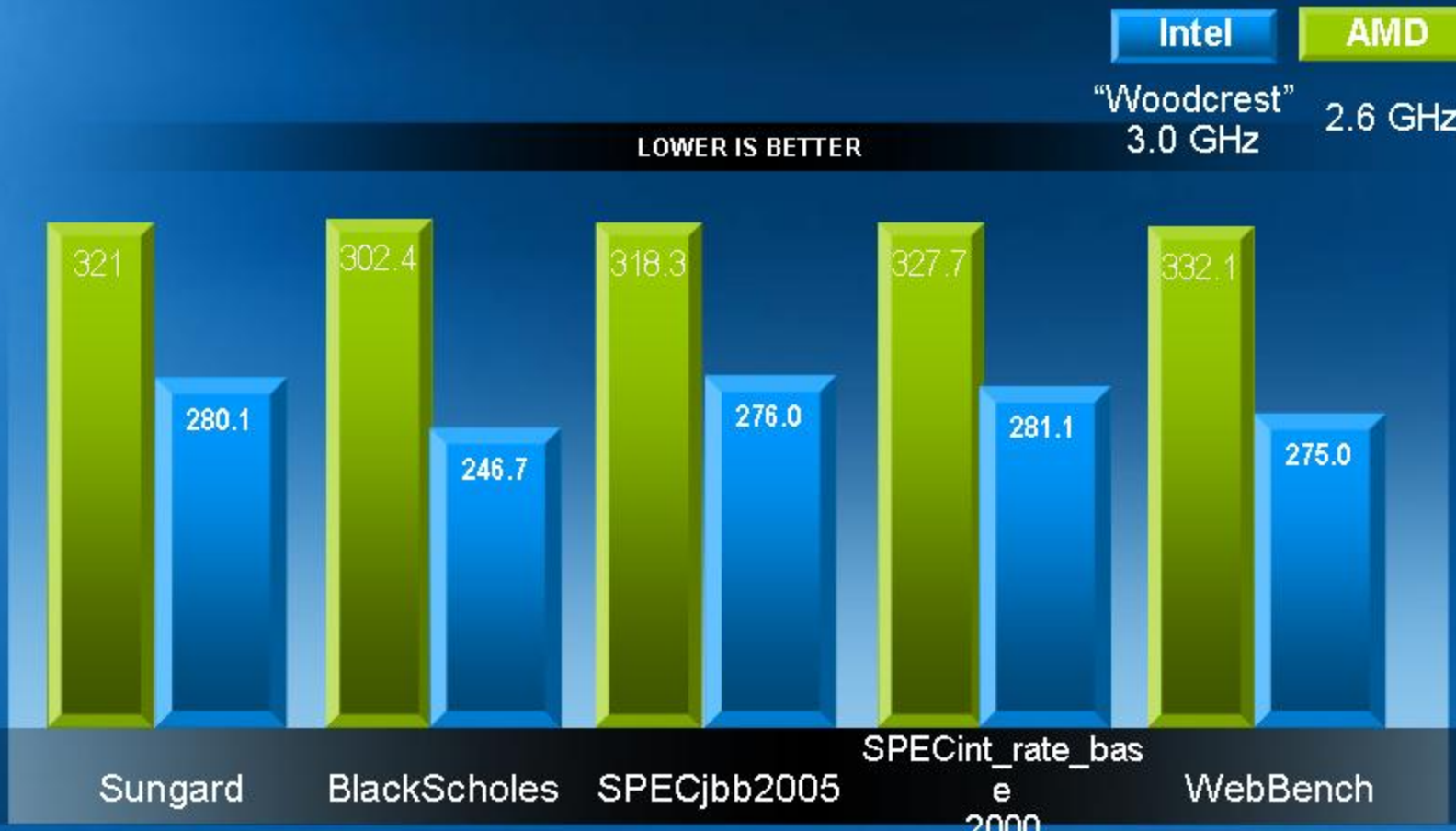
Server Power Consumption
"Watts at the Wall"

- Benchmark during steady-state performance window
- Average system power measured during the window



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Average System Power Consumption
"Watts at the Wall"



Intel® Xeon® Platforms Consume Less Power

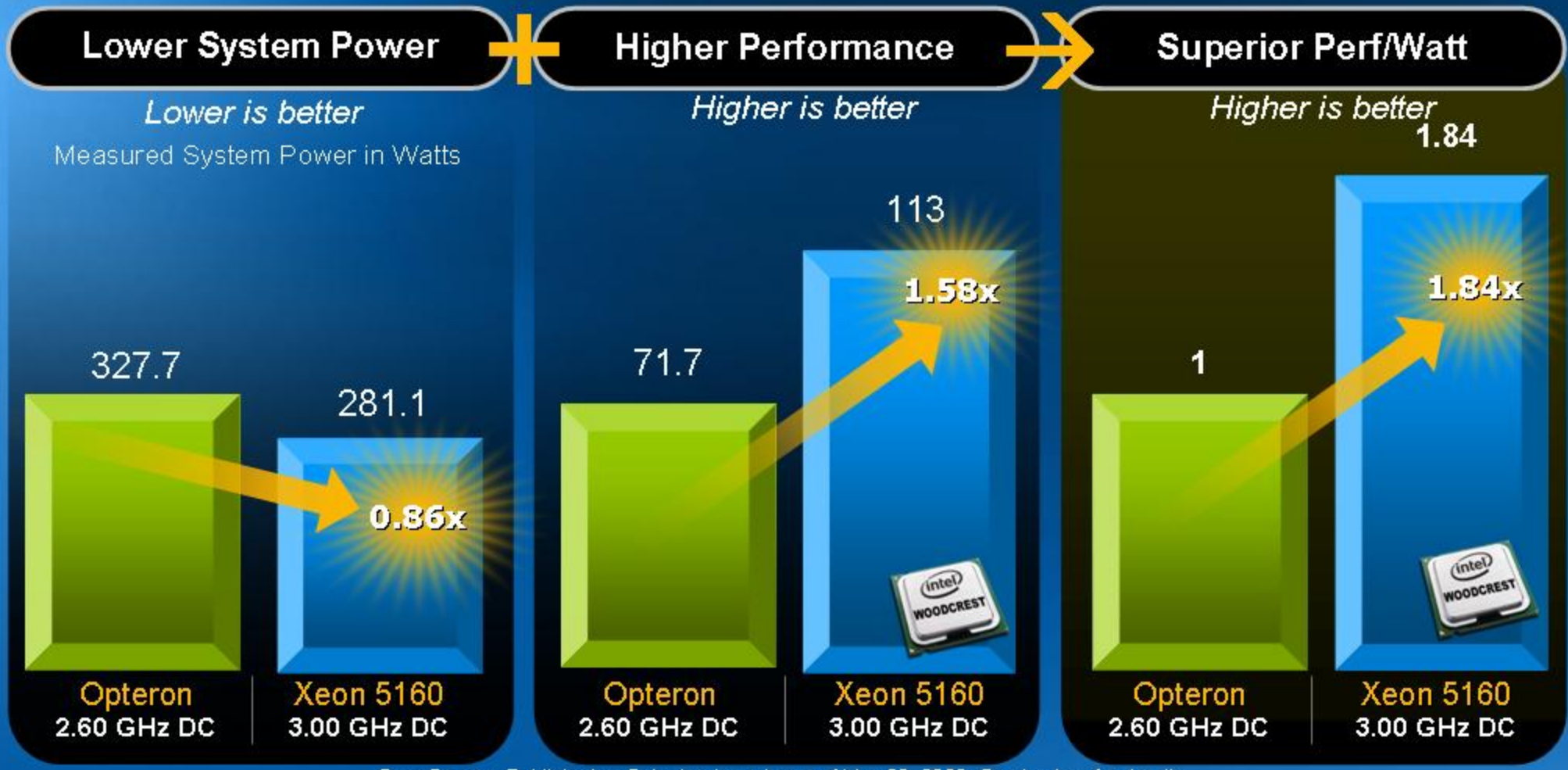
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Data Source: Published or Submitted results as of May 23, 2006. See backup for details

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Dual-Core Intel® Xeon® processor 5100 Series Based Servers

Energy Efficient General Purpose Computing with SPECint_rate_base2000*



Data Source: Published or Submitted results as of May 23, 2006. See backup for details

1.84x Performance/Watt on SPECint_rate_base2000

Xeon 5080 – Dual-Core Intel® Xeon® Processor 5080; (Dempsey 3.73GHz)
Xeon 5160 – Dual-Core Intel® Xeon® Processor 5160; (Woodcrest 3.00GHz)

Opteron 2.60 DC – Dual-Core AMD Opteron™ Model 285 (2.60GHz)

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Bensley/Woodcrest Platform

Performance Per System Watt Comparison

Perf/Watt

Dual-Core Intel® Xeon® processor 5160 vs Dual-Core AMD Opteron* 285

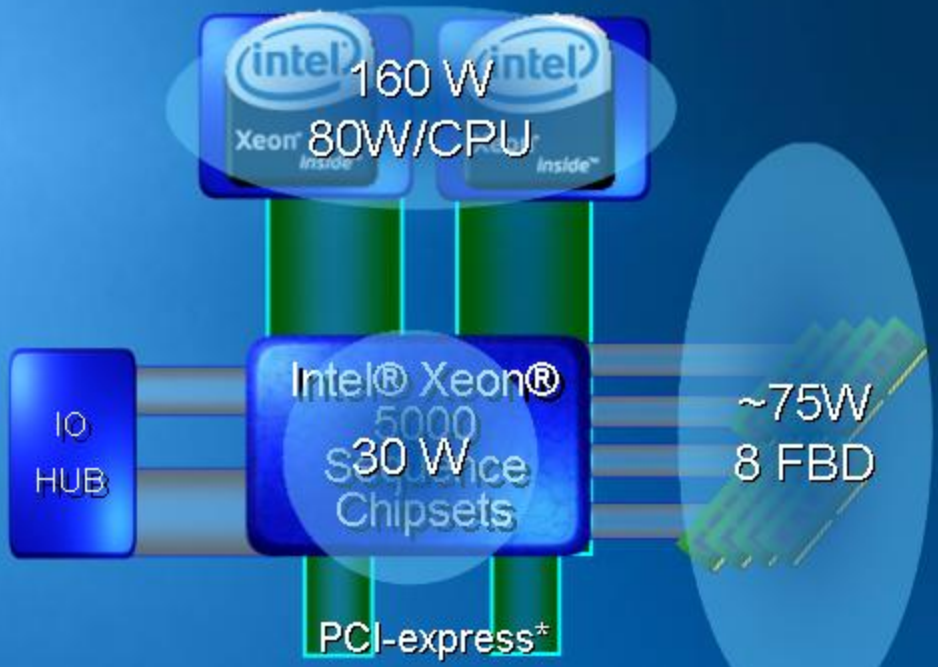


Data Source: Published or Submitted results as of May 23, 2006. See backup for details

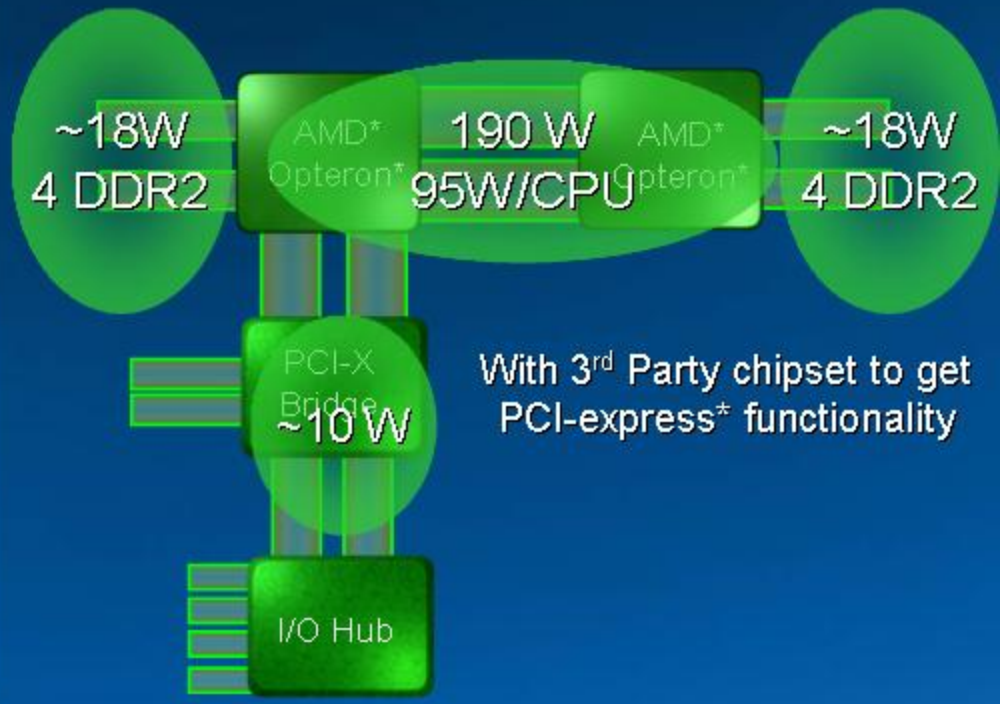
Energy-efficient Intel Xeon Processor 5160 delivers Perf/Watt leadership

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What's Wrong with Selective TDP Comparisons?



The FBD AMB "buffer" TDP is 4.5-6.1W. The AMB replaces both the PLL and register (~1.2W) on a DDR2 rDIMM. Net power addition of AMB over a DDR2 rDIMM is 3.3-4.9W.



With 3rd Party chipset to get PCI-express* functionality

Subtotal TDP (W) for Selected Components

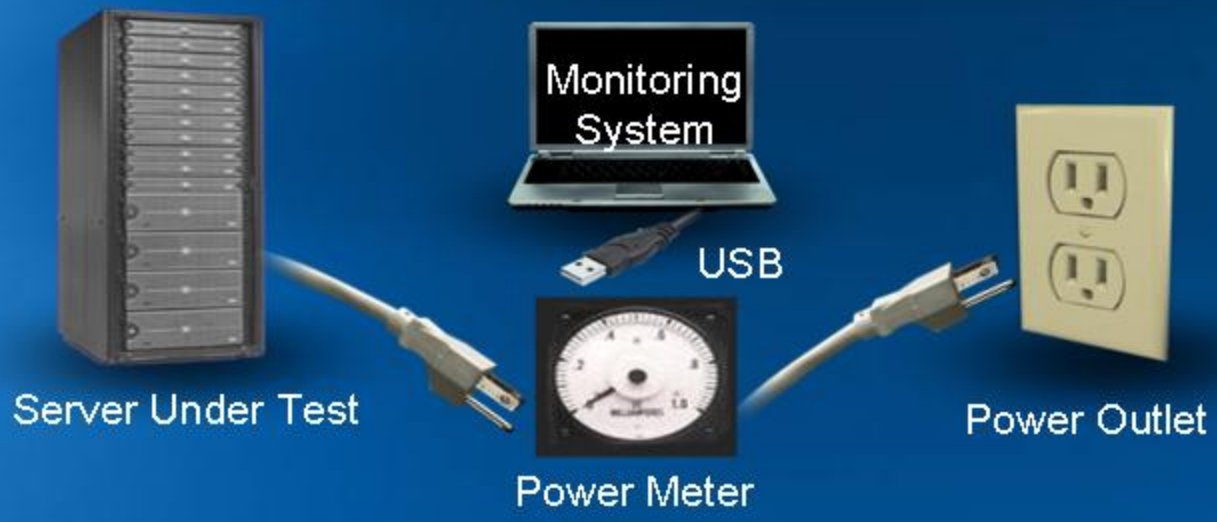
~228W	4 DIMMs	~220W
~265W	8 DIMMs	~239W

TDP Comparisons ≠ "Watts at the Wall"

Source Intel Corp.

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TDP Comparisons ≠ "Watts at the Wall"



$$\text{Performance Per Watt} = \frac{\text{System Performance}}{\text{System Power Consumption}}$$

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Itanium® Momentum

"Global 100" Deployments



- 76 of the world's 100 largest companies committed to IPF

$10B ISA investment '06-'10

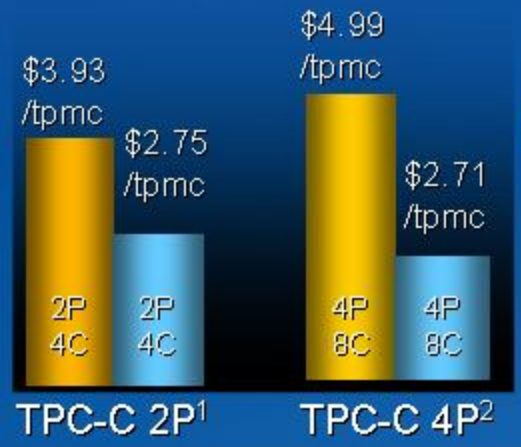
sas, bea, Microsoft, FUJITSU, SYBASE, intel, UNISYS, Novell, BULL, SAP, sgi, ORACLE, hp, FUJITSU SIEMENS COMPUTERS, HITACHI Inspire the Next, redhat

Application Growth



Source: Itanium Solutions Alliance

Price / Performance Leadership



Lower is better

Power5 570

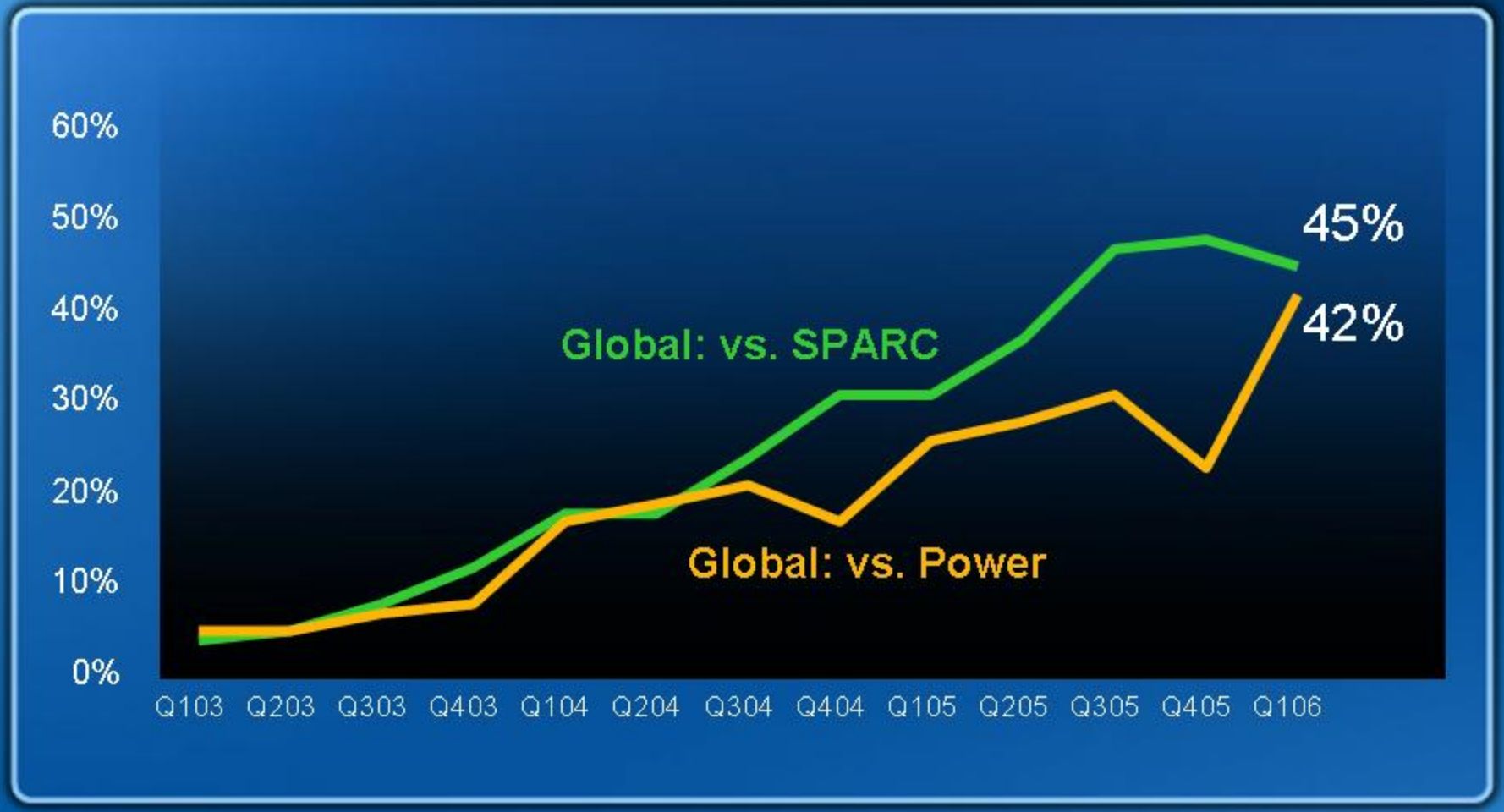
Platforms based on Itanium® 2 Montecito

1 Source www.tpc.org : Source www.tpc.org : IBM eServer p5 570 4P, POWER5 1.9GHz, 4P, (2 processors, 4 cores, 8 threads), 128 GB memory, Oracle DataBase 10g Enterprise Edition, IBM AIX 5L V5.3, result of 201,419 tpmC $3.93/tpmC, published on 10/17/05. Itanium® 2 processor results of 200,829 tpmC and $2.75/tpmC on HP Integrity rx4640 using 2 Itanium® 2 processors 1.6GHz with 24MB L3 cache, (2 processors, 4 cores, 8 threads), 128GB memory, Oracle DataBase 10g Enterprise Edition, HP UX 11.iv2 64-Bit Base OS, was published on 03/21/06.

2 Source www.tpc.org : HP Integrity rx4640-8 4p c/s, an Intel DC Itanium2 Processor 9050 1.6 Ghz, (4 processors, 8 cores, 16 threads) , with 24M L3 Cache, 128GB memory, Microsoft SQL Server 2005 Enterprise Itanium Ed., Microsoft Windows Server 2003 Enterprise Edition SP1, published a result of 290,644 tpmc, $/tpmc of 2.71 USD, on 3/27/2006. IBM eServer p5 570 8P, IBM POWER5 1.9GHz, (4 processors, 8 cores, 16 threads), 256GB memory, IBM DB2 UDB 8.1, submitted a result of 429000 tpmc, 4.99 USD/tpmc on 8/31/2004.

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Itanium® vs. SPARC* and IBM Power*:
Relative System Revenue (Global)

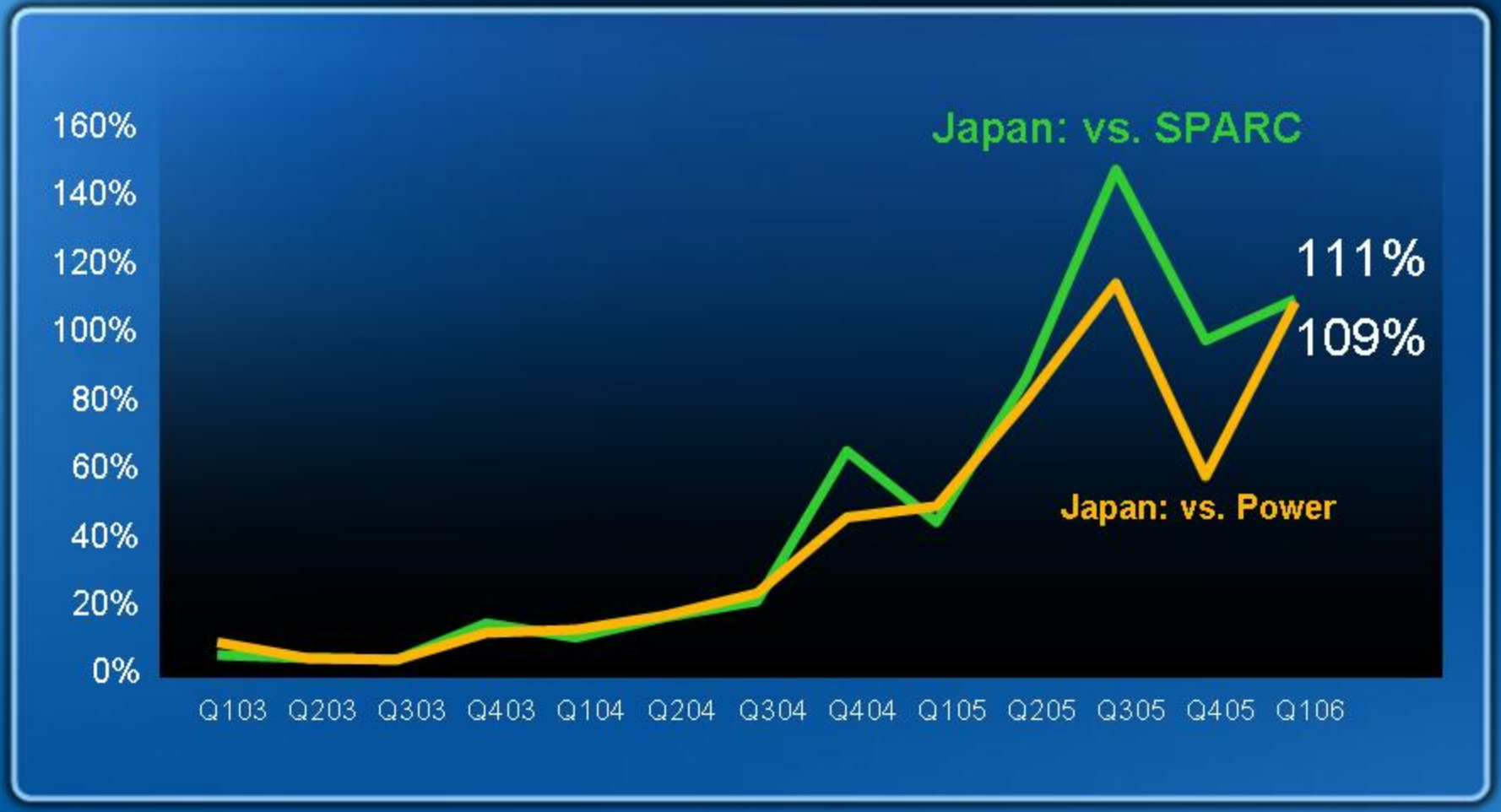


Source: IDC Q1'06 WW Quarterly Server Tracker, Customer Revenue

SPARC Includes: SPARC I, SPARC II, SPARC III, SPARC IV, SPARC 64 and SPARC 64 V
POWER Includes: Power RS64 II, Power RS64 III, Power RS64 III, Power 3, Power 4, Power 5, and PowerPC

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Itanium® vs. SPARC* and IBM Power*:
Relative System Revenue (Japan)



Source: IDC Q1'06 WW Quarterly Server Tracker, Customer Revenue

SPARC Includes: SPARC I, SPARC II, SPARC III, SPARC IV, SPARC 64 and SPARC 64 V
POWER Includes: Power RS64 II, Power RS64 III, Power RS64 III, Power 3, Power 4, Power 5, and PowerPC

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The Next Generation of Itanium®: Montecito



- ~2x performance
- Nearly 3x cache size
- 4x thread count
- >2.5x power efficiency improvement
- Robust virtualization capabilities
- Increased cache reliability

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Long Term Leadership…

Industry Firsts

- 65nm manufacturing
- Top to bottom dual core
- HW assisted virtualization
- Feb '06: Quad core demo

Energy-Efficient Performance

- Breakthrough performance
- Improving performance/Watt

Advanced Technologies

- Intel® Virtualization Technology
- Intel® I/O Acceleration Technology
- FB-DIMM
- Best-in-class reliability features

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Leap ahead™

Risk Factors

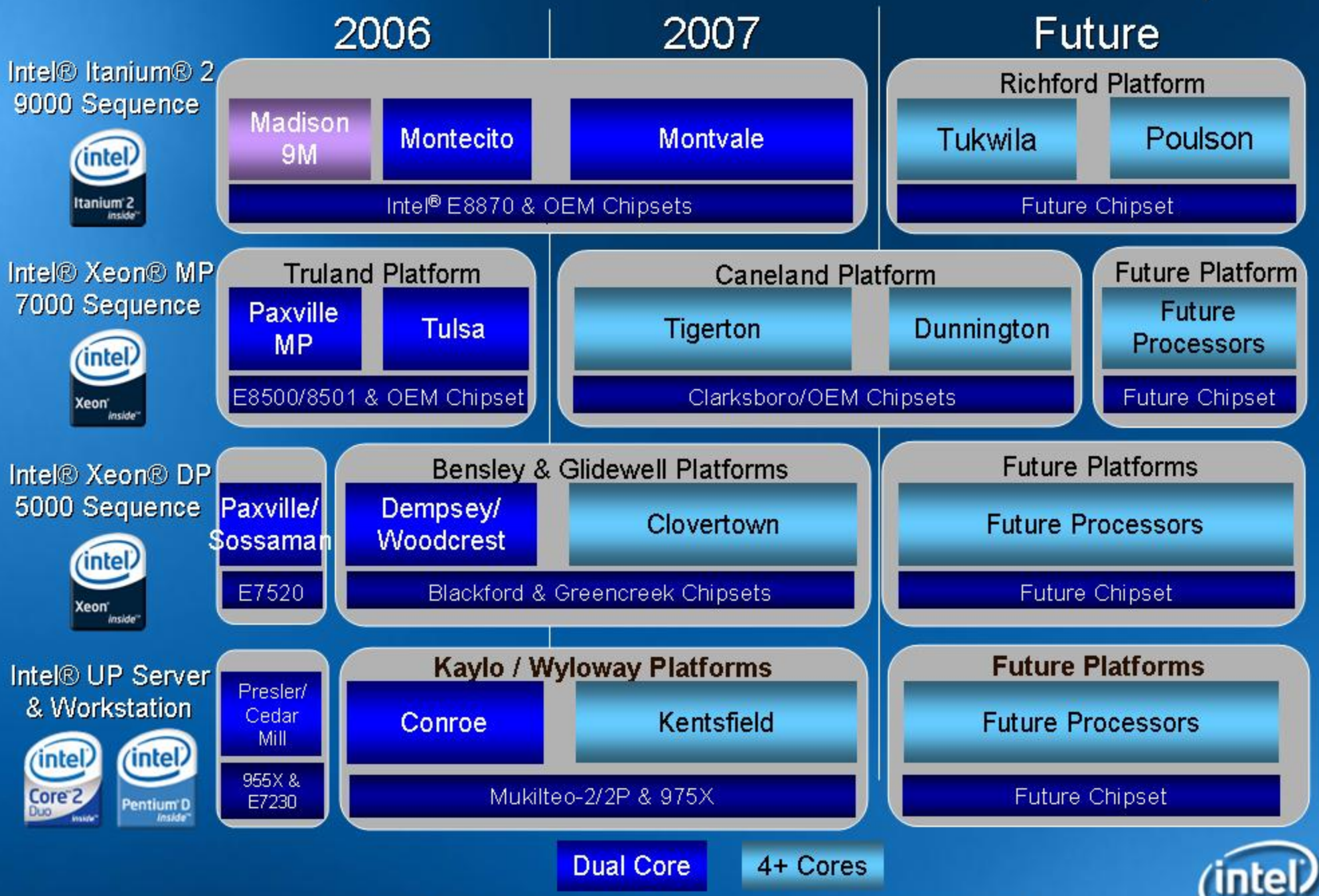
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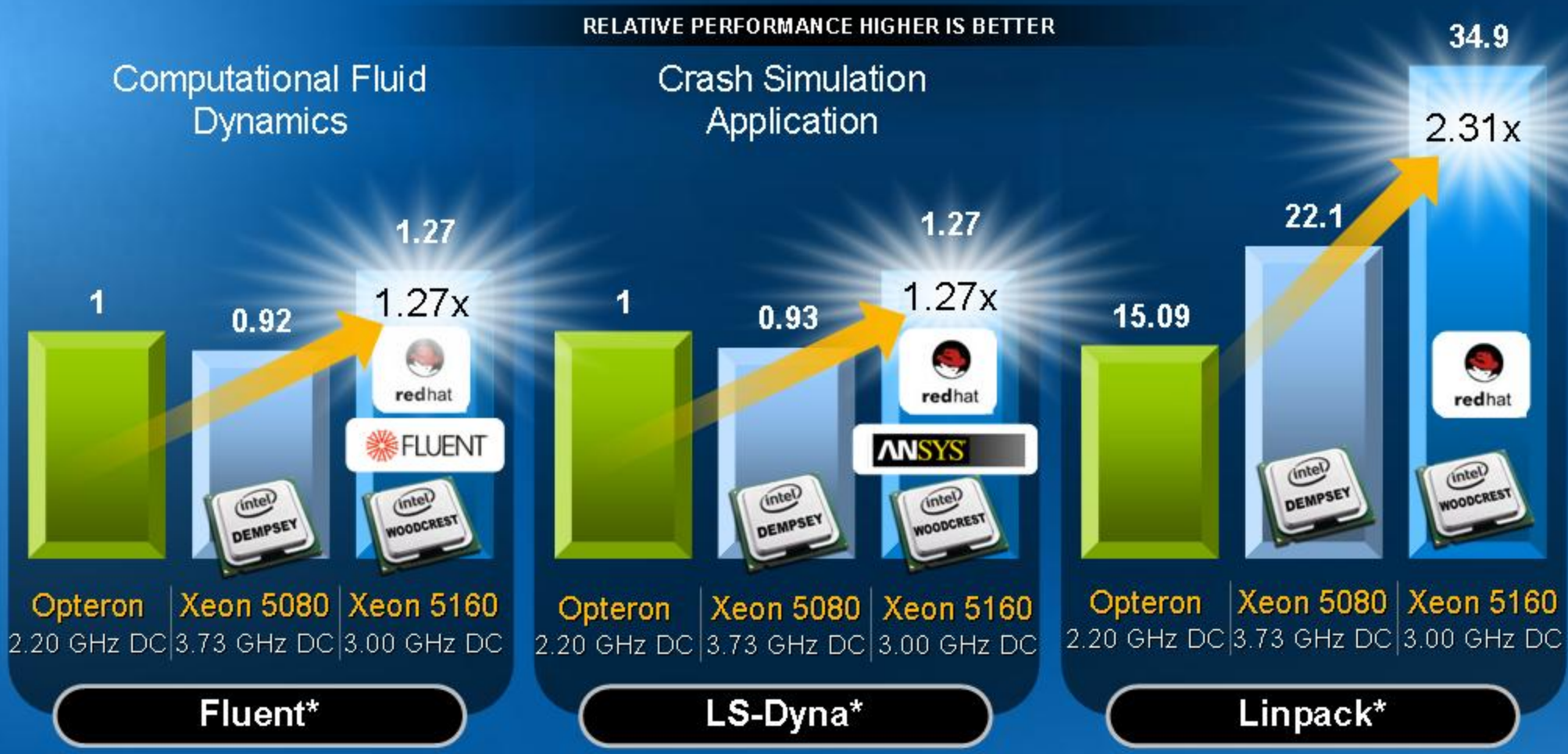
Intel® Server & Workstation Platform Roadmap



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Bensley Platform Performance

Published Results on HPC Applications



Data Source: Published or Submitted results as of May 23, 2006. See backup for details

Intel Xeon Processor 5160 shows strong Performance gains on HPC

Xeon 5080 – Dual-Core Intel Xeon Processor 5080
Xeon 5160 – Dual-Core Intel Xeon Processor 5160

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Config Details – Key Messages

- All dates and products specified are for planning purposes only and are subject to change without notice
- **Woodcrest vs Paxville DP Performance: Based on SPECjbb2005 published results**
- **Dual-Core Intel Xeon Processor 2.80 GHz based platform details:** Fujitsu Siemens Computers PRIMERGY RX300 S2 server platform: Two Dual-Core Intel® Xeon® processors 2.80 GHz with 2x2MB L2 cache 800 MHz system bus, 4 GB DDR2, Microsoft Windows Server* 2003. Java HotSpot(TM) Server VM (build 1.5.0_06-b05). Referenced as published at 41986 bops and 41986 bops/jvm For more information see http://www.spec.org/jbb2005/results/res2005q4/jbb2005-20051206-00040.html
- Dual-Core Intel Xeon Processor 5160 based platform details: Fujitsu Siemens PRIMERGY RX200 S3 Server platform with two Dual-Core Intel Xeon Processor 5160, 3.00 GHz with 4M L2 Cache, 1333 MHz system bus, 8GB (8x1GB) FB-DIMM memory, Windows 2003 Enterprise Edition. BEA JRockit(R) 5.0 P26.4.0. Result submitted to www.spec.org for review at 96404 bops and 96404 bops/jvm as of May 23, 2006.
- **Performance Per Watt:**
- **Based on Intel internal data on Paxville and for Woodcrest Based on Results published on SPECint_rate_base2000 with Power measurements by Principled Technologies at http://www.principledtechnologies.com/clients/reports/Intel/WSPECint_rate_0506.pdf as of May 23, 2006**
- **Woodcrest vs Opteron:**
- **Performance Claim: Based on SPECint_rate_base2000 published results**
- **Dual-Core Intel Xeon Processor 5160 based platform details:** Dell PowerEdge 2950 Server platform with two Dual-Core Intel Xeon Processor 5160, 3.00 GHz with 4M L2 Cache, 1333 MHz system bus, 8GB (8x1GB) FB-DIMM memory, Microsoft Windows Server* 2003. SPEC binaries built with Intel C/C++ Compiler 9.1. Result submitted to www.spec.org for review at 123 as of May 22, 2006.
- **Dual-Core AMD Opteron Processor Model 285 based platform details:** HP Proliant DL145 G2 Server platform with two Dual-Core AMD Opteron™ processor Model 285, 2.60GHz with 1MB L2 Cache, 16GB (8x2GB) PC3200 memory. Microsoft Windows Server 2003 OS, SPEC binaries built with Intel C/C++ Compiler 8.0. Referenced as published at 76.4. For more information see http://www.spec.org/cpu2000/results/res2006q1/cpu2000-20060306-05697.html
- **Performance Per Watt: Based on Results published on SPECint_rate_base2000 with Power measurements by Principled Technologies at http://www.principledtechnologies.com/clients/reports/Intel/WSPECint_rate_0506.pdf as of May 23, 2006**
- **Dual-Core Intel Xeon Processor 5160 based platform details:** Intel preproduction Server platform with two Dual-Core Intel Xeon Processor 5160, 3.00 GHz with 4M L2 Cache, dual 1333 MHz system bus, 8GB (8x1GB) 667MHz FB-DIMM memory; Microsoft Windows Server x32 Enterprise Edition. SPEC binaries build with Intel compiler 9.0.
- **Dual-Core AMD Opteron Processor Model 285 based platform details:** Server platform with two Dual-Core AMD Opteron™ processor Model 285, 2.60GHz, 8GB PC3200 memory. Microsoft Windows Server x32 Enterprise Edition. SPEC binaries build with Intel compiler 9.0.

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Config Details – Key Messages

- All dates and products specified are for planning purposes only and are subject to change without notice
- **Dempsey vs Paxville DP Performance: Based on SPECjbb2005 published results**
- **Dual-Core Intel Xeon Processor 2.80 GHz based platform details:** Fujitsu Siemens Computers PRIMERGY RX300 S2 server platform: Two Dual-Core Intel® Xeon® processors 2.80 GHz with 2x2MB L2 cache 800 MHz system bus, 4 GB DDR2, Microsoft Windows Server* 2003. Java HotSpot(TM) Server VM (build 1.5.0_06-b05). Referenced as published at 41986 bops and 41986 bops/jvm For more information see http://www.spec.org/jbb2005/results/res2005q4/jbb2005-20051206-00040.html
- **Dual-Core Intel Xeon Processor 5080 based platform details:** Dell PowerEdge 2950 server platform with two Intel® Xeon® processor 5080, 3.73 GHz with 2x2M L2 Cache, 1066 MHz system bus, 8 GB FBDimm memory, Microsoft Windows Server* 2003. BEA JRockit(R) 5.0 P26.0.0. Referenced as published at 64,288 bops and 64288 bops/jvm. For more information see http://www.spec.org/jbb2005/results/res2006q2/jbb2005-20060411-00100.html
- **Woodcrest vs Irwindale Performance:**
- **Intel Xeon Processor 3.60 GHz based platform details:** Fujitsu Siemens Computers PRIMERGY RX200 S2 server platform with two 64-bit Intel® Xeon™ processors 3.60 GHz with 2MB L2 Cache and 800 MHz system bus 4GB (8x512 MB) DDR2 memory; Microsoft Windows Server 2003 Standard Edition. SPEC binaries built with Intel C/C++ Compiler 9.0. Referenced as published at 40.5. For more information see http://www.spec.org/cpu2000/results/res2005q4/cpu2000-20051128-05117.html
- **Dual-Core Intel Xeon Processor 5160 based platform details:** Dell PowerEdge 2950 Server platform with two Dual-Core Intel Xeon Processor 5160, 3.00 GHz with 4M L2 Cache, 1333 MHz system bus, 8GB (8x1GB) FB-DIMM memory, Microsoft Windows Server* 2003. SPEC binaries built with Intel C/C++ Compiler 9.1. Result submitted to www.spec.org for review at 123 as of May 22, 2006.
- **Woodcrest vs Irwindale Perf/Watt: Based on Results published on SPECint_rate_base2000 with Power measurements by Principled Technologies at http://www.principledtechnologies.com/clients/reports/Intel/WSPECint_rate_0506.pdf as of May 23, 2006**
- **Intel Xeon Processor 3.60 GHz based platform details:** Intel preproduction Server platform with two 64-bit Intel® Xeon™ processors 3.60 GHz with 2MB L2 Cache and 800 MHz system bus and 8GB (8x1024 MB) DDR2-400 memory, Microsoft Windows Server x32 Enterprise Edition. SPEC binaries build with Intel compiler 9.0.
- **Dual-Core Intel Xeon Processor 5160 based platform details:** Intel preproduction Server platform with two Dual-Core Intel Xeon Processor 5160, 3.00 GHz with 4M L2 Cache, dual 1333 MHz system bus, 8GB (8x1GB) 667MHz FB-DIMM memory; Microsoft Windows Server x32 Enterprise Edition. SPEC binaries build with Intel compiler 9.0.

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Config Details - Bensley Platform Performance

Published results on Integer, Java and Database Benchmarks

- SPECint_rate_base2000:
- **Dual-Core Intel Xeon Processor 5080 based platform details:** Fujitsu Siemens Computers PRIMERGY RX300 S3 server platform with two Dual-Core Intel® Xeon® processor 5080, 3.73 GHz with 2x2M L2 Cache, 1066 MHz system bus, 8GB (8x1GB) FB-DIMM memory, Microsoft Windows Server* 2003. SPEC binaries built with Intel C/C++ Compiler 9.0. Referenced as published at 81.2. For more information see http://www.spec.org/cpu2000/results/res2006q1/cpu2000-20060306-05674.html
- **Dual-Core Intel Xeon Processor 5160 based platform details:** Dell PowerEdge 2950 Server platform with two Dual-Core Intel Xeon Processor 5160, 3.00 GHz with 4M L2 Cache, 1333 MHz system bus, 8GB (8x1GB) FB-DIMM memory, Microsoft Windows Server* 2003. SPEC binaries built with Intel C/C++ Compiler 9.1. Result submitted to www.spec.org for review at 123 as of May 22, 2006.
- **Dual-Core AMD Opteron Processor Model 285 based platform details:** HP Proliant DL145 G2 Server platform with two Dual-Core AMD Opteron™ processor Model 285, 2.60GHz with 1MB L2 Cache, 16GB (8x2GB) PC3200 memory. Microsoft Windows Server 2003 OS, SPEC binaries built with Intel C/C++ Compiler 8.0. Referenced as published at 76.4. For more information see http://www.spec.org/cpu2000/results/res2006q1/cpu2000-20060306-05697.html
- SPECjbb2005:
- **Dual-Core Intel Xeon Processor 5080 based platform details:** Dell PowerEdge 2950 server platform with two Intel® Xeon® processor 5080, 3.73 GHz with 2x2M L2 Cache, 1066 MHz system bus, 8 GB FBDimm memory, Microsoft Windows Server* 2003. BEA JRockit(R) 5.0 P26.0.0. Referenced as published at 64,288 bops and 64288 bops/jvm. For more information see http://www.spec.org/jbb2005/results/res2006q2/jbb2005-20060411-00100.html
- **Dual-Core Intel Xeon Processor 5160 based platform details:** Fujitsu Siemens Server platform with two Dual-Core Intel Xeon Processor 5160, 3.00 GHz with 4M L2 Cache, 1333 MHz system bus, 8GB (8x1GB) FB-DIMM memory, Windows 2003 Enterprise Edition. BEA JRockit(R) 5.0 P26.4.0. Result submitted to www.spec.org for review at 96404 bops and 96404 bops/jvm as of May 21, 2006.
- **Dual-Core AMD Opteron Processor Model 280 based platform details:** Fujitsu Siemens PRIMERGY RX220 Server platform with two Dual-Core AMD Opteron™ processor Model 280, 2.40GHz with 2x1MB L2 Cache, 16GB (8x2GB) PC3200 memory. 64-Bit SUSE LINUX Enterprise Server 9 + SP3, Kernel 2.6.5-7.244-smp on x86_64. BEA JRockit(R) 5.0 R26.0.0. Referenced as published at 61155 bops and 30578 bops/jvm. For more information see http://www.spec.org/jbb2005/results/res2006q1/jbb2005-20060214-00074.html
- TPC-C
- **Dual-Core Intel Xeon Processor 5080 based platform details:** Lenovo SureServer T350 with two Intel® Xeon® processor 5080, 3.73 GHz with 2x2M L2 Cache, 1066 MHz system bus, 32 GB FBDimm memory, Microsoft Windows Server* 2003 Enterprise x64 Edition, Database Software Microsoft SQL Server 2005 Enterprise x64 Edition. Referenced as published at 125,954 tpmC; 65.63 China Yuan/tpmC; Availability Date as listed in the submitted report is July 1, 2006. Results at http://www.tpc.org/tpcc/results/tpcc_result_detail.asp?id=106050301
- **Dual-Core Intel Xeon Processor 5160 based platform details:** HP Proliant ML370 G5 Server platform with two Intel® Xeon® processor 5160, 3.00 GHz with 4M L2 Cache, 1333 MHz system bus, 64 GB FBDimm memory, Microsoft Windows Server* 2003 Enterprise x64 Edition, Database Software Microsoft SQL Server 2005 Enterprise x64 Edition. Referenced as published at 169,360 tpmC; $2.93/tpmC; Availability Date as listed in the submitted report is Nov 22, 2006. Results at www.tpc.org.
- **Dual-Core AMD Opteron Processor Model 285 based platform details:** HP Proliant DL385 G1 server platform with two Dual-Core AMD Opteron™ processor 2.60GHz, 32GB memory, Microsoft Windows Server 2003 Enterprise (x86) Edt. SP1, Database: Microsoft SQL Server 2005 Enterprise (x86) Edt. SP1. Referenced as published at 113,628 tpmC; $2.99/tpmC; Availability Date as listed in the submitted report is May 5, 2006. Results at http://www.tpc.org/tpcc/results/tpcc_result_detail.asp?id=106032001

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Config Details - Bensley Platform Performance

Published results on Floating Point, ERP & Collaboration Benchmarks

- SPECfp_rate_base2000:
- **Dual-Core Intel Xeon Processor 5080 based platform details:** Dell PowerEdge 2950 server platform with two Dual-Core Intel® Xeon® processor 5080, 3.73 GHz with 2x2M L2 Cache, 1066 MHz system bus, 8GB (8x1GB) FB-DIMM memory, Red Hat Enterprise Linux 4 Advanced Server Update 3 EM64T. SPEC binaries built with Intel C/C++ Compiler 9.0. Referenced as published at 66.4. For more information see http://www.spec.org/cpu2000/results/res2006q2/cpu2000-20060417-05870.html
- **Dual-Core Intel Xeon Processor 5160 based platform details:** Dell PowerEdge 2950 Server platform with two Dual-Core Intel Xeon Processor 5160, 3.00 GHz with 4M L2 Cache, 1333 MHz system bus, 8GB (8x1GB) FB-DIMM memory, Red Hat Enterprise Linux 4 Advanced Server Update 3 EM64T. SPEC binaries built with Intel C/C++ Compiler 9.0. Result submitted to www.spec.org for review at 83 as of May 22, 2006.
- **Dual-Core AMD Opteron Processor Model 285 based platform details:** Sun Ultra 40 Server platform with two Dual-Core AMD Opteron™ processor Model 285, 2.60GHz with 1MB L2 Cache, 16GB (8x2GB) PC3200 memory. SuSE Linux 9.0 SLES 64 bit (SP3) OS, SPEC binaries built with PathScale EKOPath(TM) Compiler Version 2.3. Referenced as published at 72.9. For more information see http://www.spec.org/cpu2000/results/res2006q1/cpu2000-20060306-05758.html
- SAP-SD 2-Tier
- **Dual-Core Intel Xeon Processor 5080 based platform details:** HP ProLiant ML370 G5 server platform with two Intel® Xeon® processor 5080, 3.73 GHz with 2x2M L2 Cache, 1066 MHz system bus, 32 GB FBDimm memory. Microsoft Windows Server 2003 Enterprise Edition. (64-bit) SQL Server 2005.(64-bit) SAP ECC Release 5.0. Result published at www.sap.com/solutions/benchmark at 1047 SD Users.
- **Dual-Core Intel Xeon Processor 5160 based platform details:** HP ProLiant ML370 G5 server platform with two Intel® Xeon® processor 5160, 3.00 GHz with 4M L2 Cache, 1333 MHz system bus, 32 GB FBDimm memory. Microsoft Windows Server 2003 Enterprise Edition. (64-bit) SQL Server 2005. (64-bit) SAP ECC Release 5.0. Result published at www.sap.com/solutions/benchmark at 1200 SD Users.
- **Dual-Core AMD Opteron Processor Model 285 based platform details:** IBM eServer BladeCenter Model LS20 Server with two Dual-Core AMD Opteron™ 280 processors 2.4GHz, 8x2024MB memory, Microsoft Windows Server 2003 Enterprise Edition. SQL Server 2005. SAP ECC Release 5.0. Referenced as published at http://www.sap.com/solutions/benchmark/pdf/cert1306.pdf at 995 SD Users.
- R6iNotes
- Dempsey Platform Configuration: Intel® Server Pre-Production System with two 64-bit Intel® Xeon™ Dual-Core processors Dempsey C0 3.73 GHz with 2x2 MB L2 Cache, Blackford chipset, 1066 MHz FSB; 4GB (4x1GB) dual-rank FBDIMMs - DDR2-667); Hyper Threading ON; HWP enabled and ASP enabled. SuSE* Linux* Enterprise 9 for x86-64 SP2, Linux kernel 2.6.5-7 191-smp. Application: IBM Lotus Domino Server, Release 7.0 (32-bit version) Instances: 2 Domino server instances running in dual partition configuration; Mail Template: Domino Web Access mail version R7 Gold. Intel Internal measurement
- **Dual-Core Intel Xeon Processor 5160 based platform details:** IBM System x3650 Server platform with two Dual-Core Intel Xeon Processor 5160, 3.00 GHz with 4M L2 Cache, 1333 MHz system bus, 24GB (12x2GB) FB-DIMM memory, SUSE Linux Enterprise Server 9.0 SP3. 22,000 concurrent, active users; NotesMark (transactions per minute) throughput value of 18,101. Price/performance for the iNotes workload—$2.74/User and $3.33/NotesMark. The result is currently submitted for audit and approval.
- **Dual-Core AMD Opteron Processor Model 285 based platform details:** HP Proliant DL385 Server platform with two Dual-Core AMD Opteron™ processor Model 285, 2.60GHz, 8GB memory. Windows Server 2003 OS. 17,000 concurrent, active users; NotesMark (transactions per minute) throughput value of 13,927.Referenced as published at http://h71028.www7.hp.com/ActiveAnswers/cache/70441-0-0-225-121.html

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Config Details - Bensley Platform Performance
Published results on HPC Applications

- Linpack
- **Dual-Core Intel Xeon Processor 5080 based platform details:** Intel preproduction customer reference board with two Dual-Core Intel® Xeon® processor 5080, 3.73 GHz with 2x2M L2 Cache, 1066 MHz system bus, 8GB (8x1GB) 533MHz FB-DIMM memory; Red Hat Enterprise Linux 4, Update 2, EM64T, Intel Linpack 3.0.1
- **Dual-Core Intel Xeon Processor 5160 based platform details:** Intel preproduction customer reference board with two Dual-Core Intel Xeon Processor 5160, 3.00 GHz with 4M L2 Cache, dual 1333 MHz system bus, 8GB (8x1GB) 667MHz FB-DIMM memory; Red Hat Enterprise Linux 4, Update 2, EM64T, Intel Linpack 3.0.1
- **Dual-Core AMD Opteron Processor Model 275 based platform details:** AMD "Quartet" internal development platform with two 2.2Ghz L2 Cache 2 x 1024KB, Memory: 8GB total; SuSE Professional 9.2. Libararies: Goto. Publicly available benchmark numbers cited:http://www.amd.com/us-en/Processors/ProductInformation/0,,30_118_8796_8800~96867,00.html
- Fluent
- **Dual-Core Intel Xeon Processor 5080 based platform details:** Intel preproduction customer reference board with two Dual-Core Intel® Xeon® processor 5080, 3.73 GHz with 2x2M L2 Cache, 1066 MHz system bus, 8GB (8x1GB) 533MHz FB-DIMM memory; Red Hat Enterprise Linux 4, Update 2, EM64T, Fluent 6.2.16
- **Dual-Core Intel Xeon Processor 5160 based platform details:** Intel preproduction customer reference board with two Dual-Core Intel Xeon Processor 5160, 3.00 GHz with 4M L2 Cache, dual 1333 MHz system bus, 8GB (8x1GB) 667MHz FB-DIMM memory; Red Hat Enterprise Linux 4, Update 2, EM64T, Fluent 6.2.16. Result submitted to www.fluent.org as of 5/23/2006
- **Dual-Core AMD Opteron Processor Model 275 based platform details:** IBM LS20 platform with two 2.2Ghz L2 Cache 2 x 1024KB. Publicly available benchmark numbers cited: http://www.fluent.com/software/fluent/fl5bench/flbench_6.2/fullres.htm
- LS-Dyna
- **Dual-Core Intel Xeon Processor 5080 based platform details:** Intel preproduction customer reference board with two Dual-Core Intel® Xeon® processor 5080, 3.73 GHz with 2x2M L2 Cache, 1066 MHz system bus, 8GB (8x1GB) 533MHz FB-DIMM memory; Red Hat Enterprise Linux 4, Update 2, EM64T, LS-DYNA mpp970.5434a
- **Dual-Core Intel Xeon Processor 5160 based platform details:** Intel preproduction customer reference board with two Dual-Core Intel Xeon Processor 5160, 3.00 GHz with 4M L2 Cache, dual 1333 MHz system bus, 8GB (8x1GB) 667MHz FB-DIMM memory; Red Hat Enterprise Linux 4, Update 2, EM64T, LS-DYNA mpp970.5434a. Result submitted to www.topcrunch.org as of 5/23/06
- **Dual-Core AMD Opteron Processor Model 275 based platform details:** HP DL145 platform with two 2.2Ghz L2 Cache 2 x 1024KB. Publicly available benchmark numbers cited: http://topcrunch.org/benchmark_details.sfe?query=2&id=463

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Config Detail - Bensley/Woodcrest Platform Performance

Performance Per System Watt comparison

- SunGard: Report at http://www.principledtechnologies.com/clients/reports/Intel/WSunGard_ACR_0506.pdf
- **Dual-Core Intel Xeon Processor 5160 based platform details:** Intel preproduction Server platform with two Dual-Core Intel Xeon Processor 5160, 3.00 GHz with 4M L2 Cache, dual 1333 MHz system bus, 8GB (8x1GB) 667MHz FB-DIMM memory; Microsoft Windows Server x32 Enterprise Edition. SunGard Adaptiv Credit Risk 64-bit version workload.
- **Dual-Core AMD Opteron Processor Model 285 based platform details:** Server platform with two Dual-Core AMD Opteron™ processor Model 285, 2.60GHz, 8GB PC3200 memory. Microsoft Windows Server x32 Enterprise Edition. SunGard Adaptiv Credit Risk 64-bit version workload.
- Black-Scholes Report at http://www.principledtechnologies.com/clients/reports/Intel/WBlack_Scholes_0506.pdf
- **Dual-Core Intel Xeon Processor 5160 based platform details:** Intel preproduction Server platform with two Dual-Core Intel Xeon Processor 5160, 3.00 GHz with 4M L2 Cache, dual 1333 MHz system bus, 8GB (8x1GB) 667MHz FB-DIMM memory; Microsoft Windows Server x32 Enterprise Edition. Black-Scholes 64-bit version kernel workload.
- **Dual-Core AMD Opteron Processor Model 285 based platform details:** Server platform with two Dual-Core AMD Opteron™ processor Model 285, 2.60GHz, 8GB PC3200 memory. Microsoft Windows Server x32 Enterprise Edition. Black-Scholes 64-bit version kernel workload.
- WebBench: Report at http://www.principledtechnologies.com/clients/reports/Intel/WWebBench_0506.pdf
- **Dual-Core Intel Xeon Processor 5160 based platform details:** Intel preproduction Server platform with two Dual-Core Intel Xeon Processor 5160, 3.00 GHz with 4M L2 Cache, dual 1333 MHz system bus, 8GB (8x1GB) 667MHz FB-DIMM memory; Microsoft Windows Server x32 Enterprise Edition. WebBench 5.0 (128-bit US version) industry-standard benchmark.
- **Dual-Core AMD Opteron Processor Model 285 based platform details:** Server platform with two Dual-Core AMD Opteron™ processor Model 285, 2.60GHz, 8GB PC3200 memory. Microsoft Windows Server x32 Enterprise Edition. WebBench 5.0 (128-bit US version) industry-standard benchmark.
- SPECint_rate_base2000: Report at http://www.principledtechnologies.com/clients/reports/Intel/WSPECint_rate_0506.pdf
- **Dual-Core Intel Xeon Processor 5160 based platform details:** Intel preproduction Server platform with two Dual-Core Intel Xeon Processor 5160, 3.00 GHz with 4M L2 Cache, dual 1333 MHz system bus, 8GB (8x1GB) 667MHz FB-DIMM memory; Microsoft Windows Server x32 Enterprise Edition. SPEC binaries build with Intel compiler 9.0.
- **Dual-Core AMD Opteron Processor Model 285 based platform details:** Server platform with two Dual-Core AMD Opteron™ processor Model 285, 2.60GHz, 8GB PC3200 memory. Microsoft Windows Server x32 Enterprise Edition. SPEC binaries build with Intel compiler 9.0.
- WMLS: Report at http://www.principledtechnologies.com/clients/reports/Intel/WWMLS_05006.pdf
- **Dual-Core Intel Xeon Processor 5160 based platform details:** Intel preproduction Server platform with two Dual-Core Intel Xeon Processor 5160, 3.00 GHz with 4M L2 Cache, dual 1333 MHz system bus, 8GB (8x1GB) 667MHz FB-DIMM memory; Microsoft Windows Server x32 Enterprise Edition.
- **Dual-Core AMD Opteron Processor Model 285 based platform details:** Server platform with two Dual-Core AMD Opteron™ processor Model 285, 2.60GHz, 8GB PC3200 memory. Microsoft Windows Server x32 Enterprise Edition.

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